



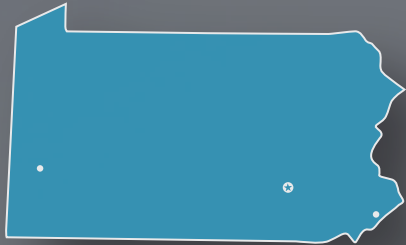
# PENNSYLVANIA OIL AND GAS WASTE REPORT

September 2019



EARTHWORKS





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September 2019

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Pennsylvania DEP (lower).

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*Dedicated to protecting communities and the environment from the  
adverse impacts of mineral and energy development while promoting  
sustainable solutions.*

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# PENNSYLVANIA FRACK WASTE REPORT



## September 2019 —Introduction

Pennsylvania is home to the first oil well in the United States, drilled in 1859, and is the second largest producer of natural gas in the nation. As this report details, Pennsylvania is also home to some of the worst pollution from oil and gas waste. Today, there are over 129,000 oil and gas wells producing waste<sup>1</sup> in The Keystone State, and the Pennsylvania Department of Environmental Protection (DEP) estimates up to 560,000<sup>2</sup> abandoned (orphan) wells are left over from days gone by. All of these wells puncture tens of thousands of square miles of Pennsylvania's watersheds, producing oil and gas waste spills, leaks and polluting land, water and air. Since Earthworks' 2015 report *Wasting Away*, minimal protections have been gained via state law, and several key policy gaps remain that continue to expose the public to carcinogenic, radioactive toxins from oil and gas waste. This update shares case studies, reveals the latest waste data trends, and offers recommendations for protecting Pennsylvania and communities downstream.

**Trailing only behind Texas, which is almost six times larger in land mass, Pennsylvania is the second largest oil and gas producer in the United States.**

Thanks to fracking, the United States now leads the world in oil and natural gas production. Between now and 2030, the U.S. is on track to unleash 60 percent of all new oil and gas production globally – four times more than any other country<sup>3</sup>. This puts Pennsylvania in the category of 'major climate disruptor' at a time when others are transitioning to renewable energy and the world grapples with climate chaos.

This role also makes Pennsylvania a leading producer of **waste** from oil and gas production, which contains **carcinogens, secret fracking chemicals, heavy metals, and radioactive materials**. This waste is produced long after drilling stops<sup>4</sup> and is re-

ferred to as the "Achilles Heel" of the industry, a vulnerability that carries with it great risk for the public and environment. There is far more toxic waste than the industry has places to put it, and disposal has already led to pollution and earthquakes.<sup>5</sup>



Titusville, Pennsylvania, circa 1860 of the first well drilled in the U.S.  
(AP Photo, WikiCommons)

In Pennsylvania, oil and gas operations are solely managed by the Department of Environmental Protection (DEP). The Office of Oil and Gas Management at DEP oversees most aspects of oil and gas operations, including the monitoring of waste as long as it is generated, stored, treated, or disposed of at a well site. But when operators move the waste off of the well site (e.g., to a landfill), the Bureau of Waste Management at DEP assumes regulatory authority.



# Toxins In Oil & Gas Waste

## So what is oil and Natural gas waste, exactly?

The waste streams from the extraction and production of oil and natural gas are a combination of solid, liquid and semi-liquid materials that contain both naturally-occurring and man-made contaminants.

Drilling pulls earthen material and underground water sources to the surface that contain heavy metals, like arsenic and lead, as well as carcinogenic, radioactive elements like radium-226, which has a half-life of 1,600 years and accumulates on equipment and in the environment. Both drilling and fracking (hydraulic fracturing – a technical process used to extract oil and gas from deep, tight layers of shale) also require the use of chemical additives that add harmful toxins like benzene to the mix.

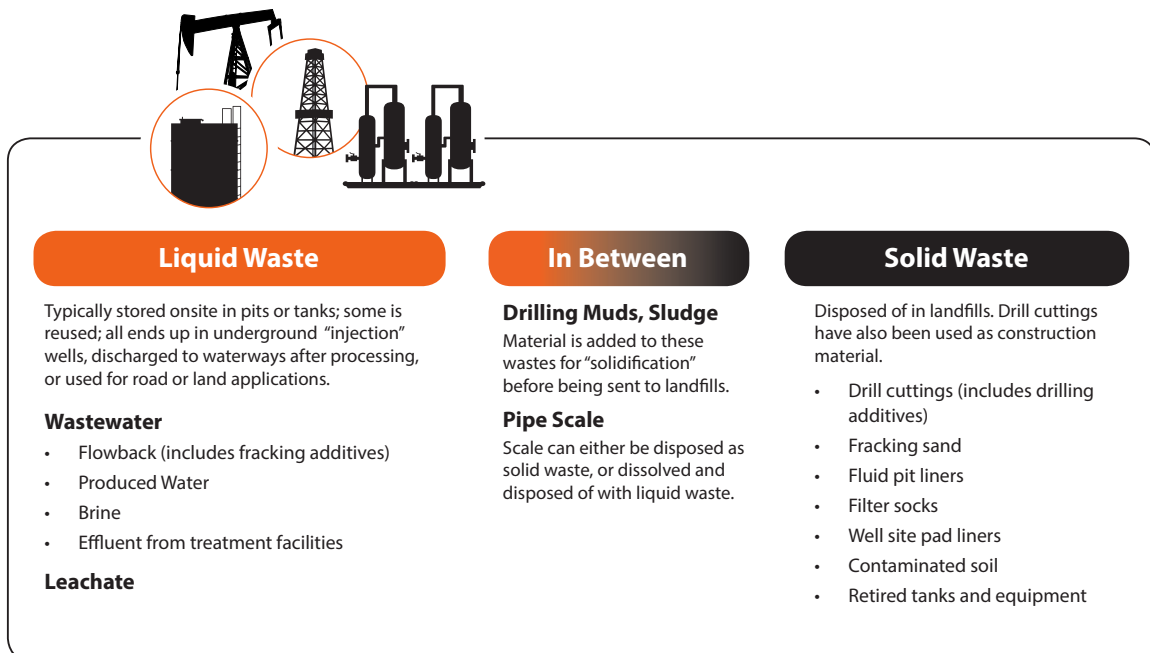
Some waste streams, like drill cuttings and fracking sand, are generated once or twice during the lifetime of an oil or gas well. But others, like wastewater and retired equipment, are produced throughout the entire lifetime of an oil or gas well.

In Pennsylvania, there are both “unconventional” and “conventional” oil and gas operations. Uncon-

ventional wells extract from deep, tight shale formations, require more intensive technologies, more water and chemical use, and produce more waste. These operations make up the “fracking boom” that started in 2004 in Pennsylvania. Conventional operations produce from shallower formations.

Both types of wells produce solid and liquid waste<sup>6</sup>, and all unconventional and conventional drilling and fracking companies enjoy exemptions from federal and state law that allow them to keep the names and quantities of the chemicals they use for their operations secret from the public. These undisclosed chemicals become part of the industry’s waste stream. According to the report *Keystone Secrets*, undisclosed fracking chemicals were injected 13,632 times into 2,515 “unconventional” gas wells in Pennsylvania between 2013 and 2017.<sup>7</sup>

**In order to properly treat oil and natural gas waste, you have to know what’s in it, and because of exemptions from federal and state law, industry doesn’t have to disclose. As a result, most oil and gas wastes are not tested for all toxins it actually contains before sent to landfills, rivers, or spread on roads.**



Radium-226 is the main radioactive material in oil and gas waste. It is water-soluble with a half-life of 1,600 years.



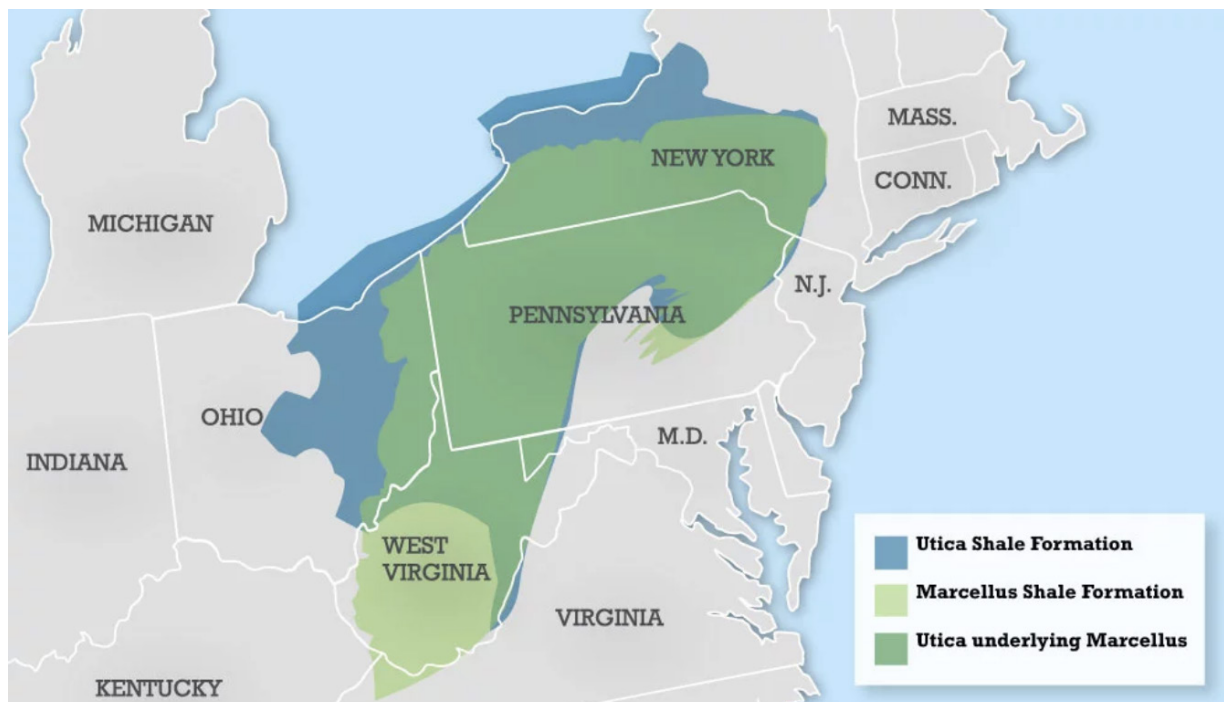
Photo: Roger Downs

## Radioactive Waste

In 2014, a West Virginia landfill rejected waste from Pennsylvania because of high radioactivity levels.<sup>8</sup> A specialized facility in Michigan eventually took the waste and an associated impoundment liner, all of which had to be processed prior to disposal to dilute the high radioactive content.<sup>9</sup>

Where does this radioactivity come from? Deep underground, the Earth contains naturally-occurring radioactive materials (NORM) that oil and natural gas drilling and fracturing bring to the surface. NORM is concentrated during these processes, turning it into TENORM (Technologically Enhanced Naturally-Occurring Radioactive Material)<sup>10</sup> as defined by U.S. EPA and state agencies, including Pennsylvania.

Studies show that oil and natural gas waste from Marcellus shale oil and gas operations in Pennsylvania, West Virginia and Ohio are more radioactive than other U.S. shale basins.<sup>11</sup>



Marcellus Shale Coalition: <https://marcelluscoalition.org/pa-map/>




# Radium – The Toxin That Never Goes Away

A toxin of particular concern in oil and natural gas waste is radium. Radium is a radioactive metal, and two of the most common types in oil and gas waste are radium-226 and radium-228. Radium-226<sup>12</sup> becomes more radioactive as it breaks down in the environment.<sup>13</sup> That means that after it's spread on roads or dumped in landfills, the overall radioactivity increases over time. Radium isotopes are also absorbed by plants and animals that live in exposed environments. The EPA and the National Academy of Sciences also recognize radium as a known human carcinogen.<sup>14</sup>

According to a U.S. EPA analysis, the average concentration of radium-226 in 74 samples of Marcellus shale wastewater was 1,700 picocuries per liter.<sup>15</sup> For comparison, the limit for drinking water is 5 picocuries per liter. A state study of radioactivity in oil and gas waste by PA DEP found that concentrations of radium in both drilling and fracking fluids were very similar, as outlined in the table below:

## RADIOACTIVE ELEMENTS IN DRILLING AND FRACKING FLUIDS



Radiological Parameter	Fracking Fluid Median Result	Drilling Fluid Median Result
Gross Alpha (pCi/L)	5,020	2,700
Gross Beta (pCi/L)	1,010	2,600
Radium 226 (pCi/L)	2,160	2,010
Radium 228 (pCi/L)	218	216
Potassium 40 (pCi/L)	283	5,220

Median (average) results for radioactive elements in drilling and fracking fluids, PA DEP TENORM Study Report, Section 9.0, p.9-2, May 1, 2016.

In its 2016 radioactivity study, DEP wrote, “[T]here is a potential for radiological environmental impacts from spills of produced water from unconventional natural gas well sites and from spills that could occur from the transportation and delivery of this fluid.” DEP found radium-226 concentrations in oil and gas wastewater samples ranging from 40.5 – 26,600 picocuries per liter.

Radium and other radioactive elements are also found in drill cuttings, drilling muds, and sludges from the bottom of storage tanks used at oil and gas sites. The processing of oil and gas wastewater at treatment facilities also creates a concentration of toxins, including radium, in the form of sludge. All of these waste streams go to landfills in Pennsylvania and other states such as Ohio, West Virginia, and New York.

As if all of this wasn't enough, studies have also revealed that the way radioactivity, and particularly radium, is tested for in shale drilling and fracking waste is problematic. In 2012, researchers found that tests used and approved by agencies like EPA “can significantly underestimate the total radioactivity of wastewater that is stored in closed containers, such as tanks.”<sup>16</sup>

**Inaccurate testing for radioactivity in oil and natural gas waste has huge implications for the places where this waste ends up. So where are those places?**



# Pennsylvania Waste Map

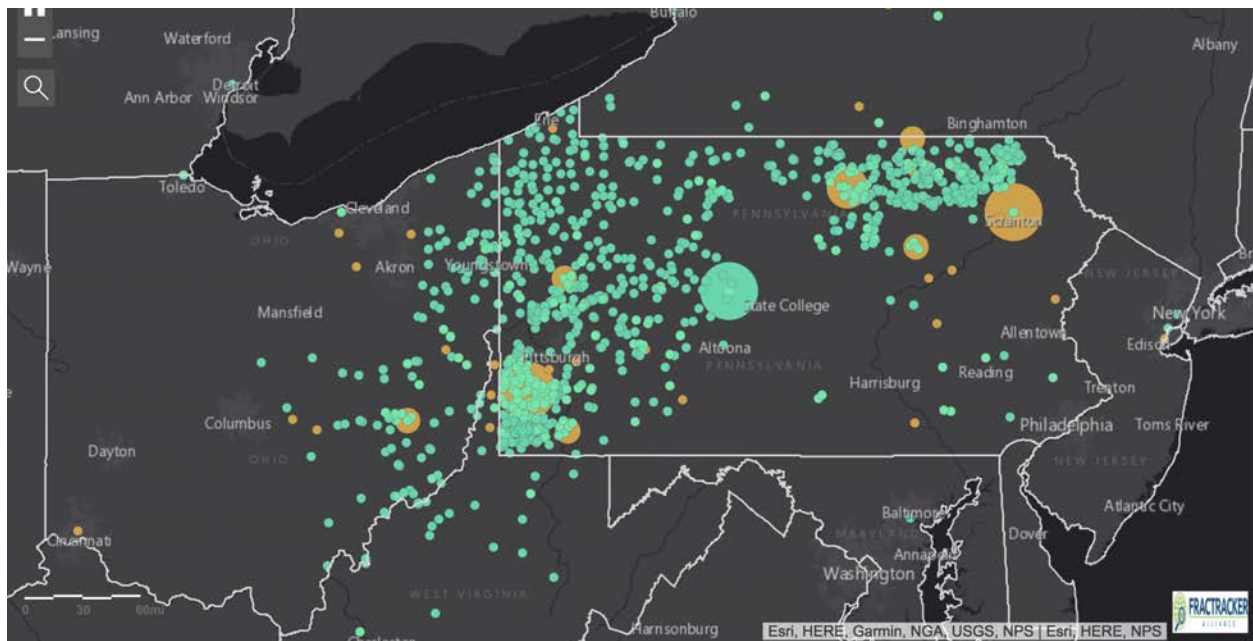
According to a recent study, more than 80% of oil and gas waste generated in Pennsylvania is kept in state.<sup>17</sup> Consequently, Pennsylvanians and communities directly downstream bear the greatest risk due to impacts from waste transportation, storage, processing and disposal. As the researchers noted, “Numerous human health hazards have been associated with waste from oil and gas extraction, including potential exposure to compounds known to cause cancer.”

To visualize where all Pennsylvania’s oil and gas waste is going, Earthworks enlisted the help of FracTracker Alliance to create the Pennsylvania Oil & Gas Waste Map using DEP data.

Ohio and West Virginia are key destinations for liquid waste, while landfills in both states, as well as in New York, accept drill cuttings and drilling muds. Maryland, New Jersey, Indiana, Texas, Utah, Idaho and Arkansas have all taken Pennsylvania’s oil and natural gas waste in the past.

“Numerous human health hazards have been associated with waste from oil and gas extraction, including potential exposure to compounds known to cause cancer.”

— *Science of the Total Environment*, 1991 – 2017



Facilities accepting Pennsylvania’s oil and gas waste. An interactive version of this map is available online at [earthworks.org/still-wasting-PA](http://earthworks.org/still-wasting-PA), where users can see how much oil and gas waste has been processed or disposed of near them since 2011.





## How much waste are we talking?

Wastewater is by far the largest oil and gas waste stream and has a few different names depending on when and where it is produced – flowback, produced water, and brine. According to the US EPA, the average wastewater volumes generated from a hydraulically fractured (fracking) well over time can reach **160,000 gallons per day in the first five days after a fracturing job. Amounts decrease over time, but wells can still produce up to 1,100 gallons of liquid waste every day for another 10 to 30 years.**<sup>18</sup>

Pennsylvania tracks waste volumes better than some other oil and gas states in the U.S. But just because waste reporting and tracking is required, doesn't mean it's accurate. In fact, the US EPA reported in 2019 that "[t]he PA DEP Waste Reports include a variety of...errors and missing information."<sup>19</sup>

Similarly, an investigation in 2014 by Pittsburgh Post-Gazette revealed significant discrepancies between the volumes that landfills report receiving and the amounts operators report producing; for example, nine facilities in Southwestern Pennsylvania reported accepting 3-4 times more oil and natural gas waste than drillers reported to PA DEP.<sup>20</sup> PA DEP told the Post-Gazette that data submitted electronically by drillers "are estimates and not necessarily based on real numbers." The estimates submitted by industry is all the public has access to, so it is impossible to know exactly how much oil and gas waste is being disposed of and where. Still, at least we have estimates.

**Drill cuttings are the industry's second largest waste stream, however, companies were not required to report volumes to the state until 2010<sup>21</sup>, about six years after horizontal shale drilling and fracking began in Pennsylvania and many decades after shallower, conventional oil and gas operations have brought untold thousands of tons of solid waste to the surface.**

Missing and incorrect information aside, the amount of waste generated in Pennsylvania, according to DEP's numbers, is still alarming. According to our comprehensive analysis of state data<sup>22</sup>:

- Between 2003, just before the fracking boom hit in Pennsylvania, and 2018, the volume of liquid oil and gas waste produced in Pennsylvania increased 1,517%.
- By 2014, volumes of waste reported by Marcellus drillers reached over 41 million barrels and 1.6 million tons and accounted for an increasing proportion of all waste generated.
- In 2018 alone, the oil and gas industry as a whole produced 69,258,726 barrels (over 2.9 billion gallons) of liquid waste in Pennsylvania, a 20.1% increase over liquid waste volumes in 2017. Solid waste produced in 2018 increased 35.6% over 2017.

### LIQUID WASTE:

First few days:  
160,000 gallons  
per day in the first  
five days after a  
fracturing job.

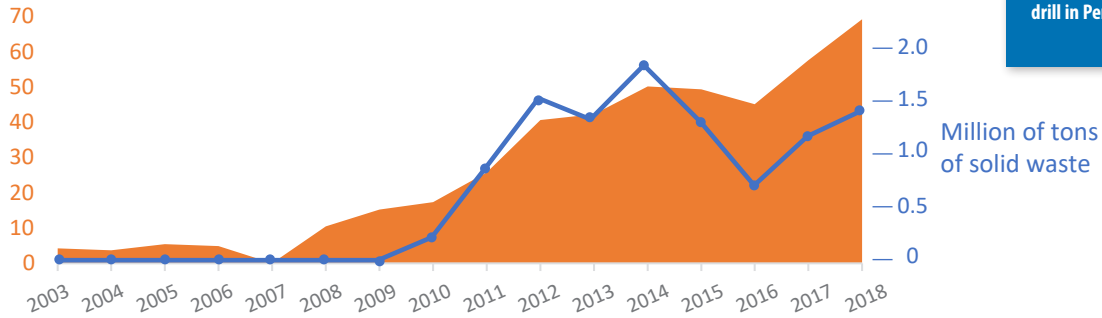
Lifetime: up to  
1,100 gallons of  
liquid waste every  
day for another 10  
to 30 years.



Over 437 million barrels of liquid oil and gas waste has been produced since the fracking boom began in 2004. That's over 18 billion gallons – an amount that would fill over 229 million household bathtubs. There are about 12 million people in Pennsylvania. If every person had 19 bathtubs, that would still not be enough to hold all of the oil and gas industry's waste over the last 15 years alone. The wells drilled today will produce waste for decades to come, not to mention the tens of thousands of new wells the industry still hopes to drill in Pennsylvania.

## LIQUID AND SOLID WASTE OIL AND NATURAL GAS WASTE VOLUMES ARE INCREASING

Millions of barrels of liquid waste



■ liquid waste  
■ solid waste

Total volumes of liquid and solid waste generated by oil and gas operations in Pennsylvania. Before 2010, operators were not required to report drill cutting (solid waste) volumes. The volume of liquid oil and gas waste rose 1,517% between 2003 (prior to the horizontal fracking boom) and 2018. Reporting of solid waste volumes to the state did not start until 2010. Solid waste was generated, but amounts are unknown.

YEAR	Liquid Waste (Barrels)	% change from previous year	Solid Waste (tons)	% change from previous year	# places waste ended up
<b>2003 (pre-fracking boom)</b>	4,282,805.73		0 tons reported		
<b>2011</b>	25,790,109.85		885,197.55		264
<b>2012</b>	40,686,426.02	57.7% increase	1,510,395.32	70.6% increase	265
<b>2013</b>	42,293,071.94	3.9% increase	1,342,343.96	11.1% decrease	256
<b>2014</b>	50,220,202.70	18.7% increase	1,574,220.08	17.3% increase	243
<b>2015</b>	49,397,350.81	1.6% decrease	1,117,754.13	29% decrease	265
<b>2016</b>	45,135,129.50	9.4% decrease	592,532.50	47% decrease	266
<b>2017</b>	57,653,022.88	27.7% increase	1,064,014.59	79.6% increase	675
<b>2018</b>	69,258,726.20	20.1% increase	1,442,465.30	35.5% increase	1223
<b>GRAND TOTALS 2011-2018 YTD</b>	380,434,039.90		9,528,923.43		

Prior to the fracking boom, solid waste was not reported to the state and liquid waste volumes were significantly less. Source: PA DEP Oil & Gas Waste Production reports, accessed August 2019.

Increasing waste volumes are not unique to Pennsylvania. A national study of hydraulic fracturing found that liquid wastewater volumes generated within the first year of production increased up to 1440% between 2011 and 2016.<sup>23</sup> Given that the amount of waste being created per well is increasing, policy revisions to remove exemptions and improve testing, tracking and disposal are more important than ever.





Photo: Frank Finan

## Waste Pollution Violations

With the increase in waste volumes comes the increased potential for spills, leaks and other incidents that can contaminate air, water, and soil, as well as impact personal property and public health. Since 2004 in Pennsylvania, several high profile incidents have made headlines:

- 2008:** Improperly treated shale gas wastewater caused a surge in levels of Total Dissolved Solids (TDS) in the Monongahela River, polluting water and leading to a bottled water advisory for Pittsburgh residents.<sup>24</sup>
- 2012:** A contract waste hauler was found guilty of illegally dumping drilling waste into Pennsylvania streams and mineshafts, a practice that went on for six years before he was caught.<sup>25</sup>
- 2013:** Drill cuttings generated at Pennsylvania well sites were trucked all the way to a specialized facility in Idaho due to their excessive levels of radioactivity.<sup>26</sup> The same year, there were nearly 600 spills of wastewater, fracturing fluids, and other substances at oil and natural gas well sites in Pennsylvania, a 70% increase since 2011.<sup>27</sup>
- 2014:** PA DEP levied a civil complaint against EQT Corporation for a 2012 leak of 300-500 gallons of flowback fluid in Tioga County that polluted soil, groundwater, and a high quality trout stream.<sup>28</sup> EQT was later fined \$1.1 million.
- 2017:** WPX (Williams Production & Exploration) was fined \$1.2 million for contaminating groundwater and five residential drinking water supplies with waste that leaked from underneath an impoundment at its fracking site in Westmoreland County, Pennsylvania.<sup>29</sup>
- January 2018:** Researchers at Duke University found that even though “conventional oil and gas wastewater is treated to reduce its radium content,” it still has created “high levels of radioactive build-up in the stream sediments” near wastewater treatments plants in Pennsylvania that process non-fracking (conventional) oil and gas drilling wastewater.<sup>30</sup>
- May 2018:** A study found that the spreading of oil and gas wastewater on roads “released over four times more radium to the environment than [oil and natural gas] wastewater treatment facilities and 200 times more radium than spill events.” Researchers also found: “...nearly all of the metals from these wastewaters leach from roads after rain events, likely reaching ground and surface water. Release of a known carcinogen (e.g., radium) from roads treated with O&G wastewaters has been largely ignored.”
- August 2019:** A Public Herald investigation uncovered that DEP allows 14 public sewage treatment plants to discharge radioactive fracking waste as landfill leachate into 13 Pennsylvania waterways.<sup>31</sup>



But the media only reports a small fraction of the overall oil and gas waste-related problems across the Commonwealth. Our analysis of violations issued by PADEP reveals over 1,000 violations were issued between 2015-2018 for oil and gas waste-related pollution in Pennsylvania, from spills and discharges of waste “into Waters of the Commonwealth” to violations involving leaking, overflowing, and improperly constructed pits and tanks used for waste storage.<sup>32</sup>

## Case Study: JKLM Energy (Potter County, PA)

A single company (JKLM Energy) operating in just one county in Pennsylvania (Potter County) was issued two “tank farm” permits in March 2019 to store millions of gallons of waste for transport to and from fracking operations, despite receiving many violations for spills on the same frack pads where the tank farms were permitted by DEP:

- NOVEMBER 2017 – Waste fluid spills, threatening pollution of waters of Commonwealth
- DECEMBER 2017 – Frack fluid spills, threatening pollution of waters of Commonwealth
- FEBRUARY 2018 – Another frack fluid spill and failure to notify regulators, water pollution
- JUNE 2018 – Failure to properly handle waste to prevent water pollution
- JUNE 2018 (two weeks later, another waste spill) – Failure to properly report pollution incident
- JULY 2018 – Spill of a substance threatening water pollution and failure to properly report
- AUGUST 2018 – Failure to contain residual waste & pollution (again) of the watershed
- SEPTEMBER 2018 – Failure to remove spilled substances
- SEPTEMBER 2018 (two weeks later) – Spills from improper storage and management of waste, new violations for outstanding prior spills
- OCTOBER 2018 – Pollution to waters of the Commonwealth and failure to contain drilling or fracking fluids

SOURCE: Pennsylvania DEP Oil & Gas Production / Waste Reports Website, [www.paoilandgasreporting.state.pa.us/publicreports](http://www.paoilandgasreporting.state.pa.us/publicreports). Accessed January 2019.

According to DEP compliance reports, JKLM Energy accrued 105 violations between April 2015 and January 2019, but only 20 enforcement actions, for pollution due to wastewater spills, drinking water contamination and more.<sup>33</sup>

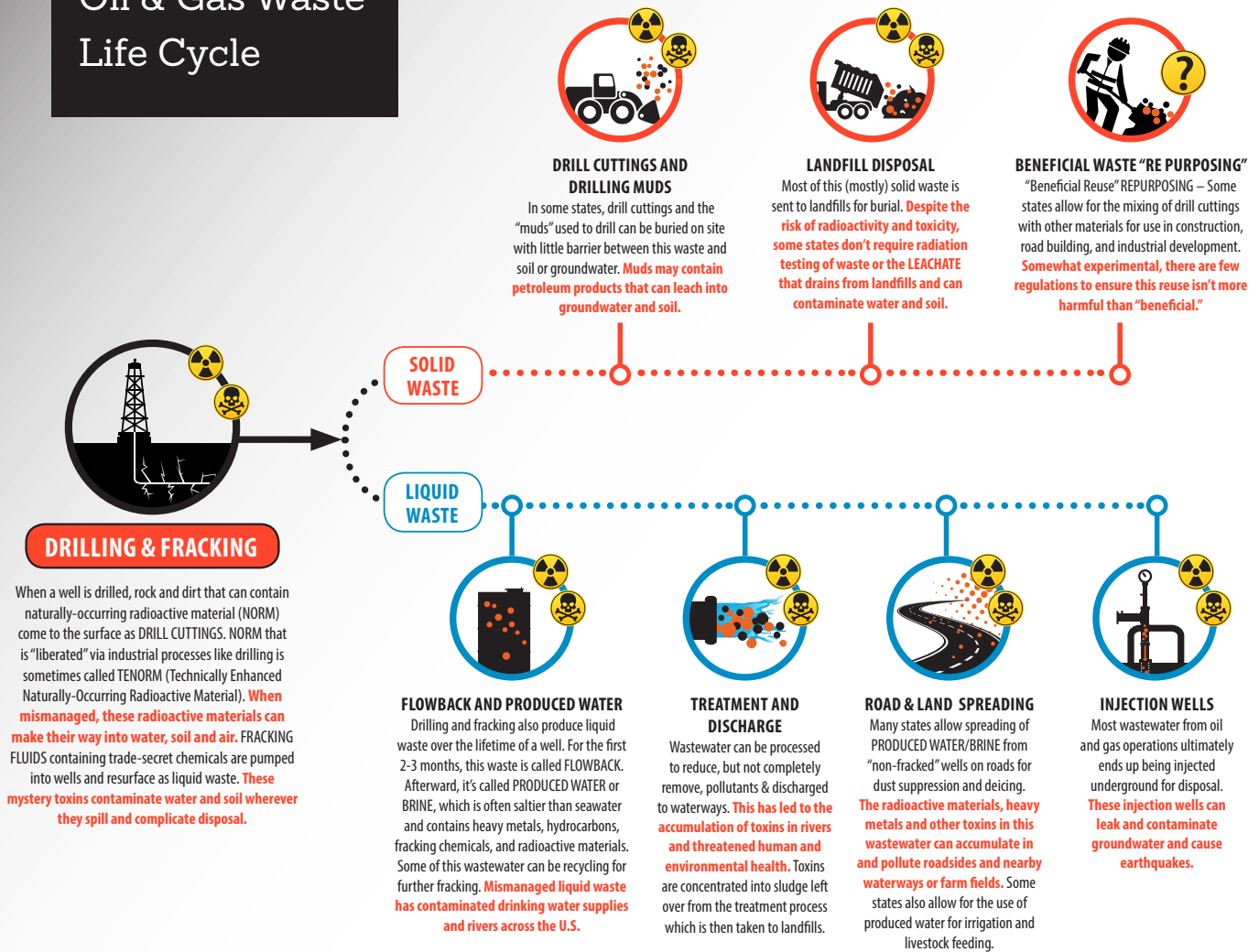
**Like most oil and gas states, Pennsylvania does not have a “bad actor” policy to penalize companies that repeatedly violate the law. Instead, companies like JKLM Energy are allowed to continue to contaminate soil, air and water and still get new permits for more fracking, more waste production, and more pollution.**



# The Life Cycle of Oil & Natural Gas Waste

Sometimes oil and gas waste gets dumped into local landfills, which can create radioactive leachate. Sometimes it gets injected into disposal wells, which can cause earthquakes. But other times it isn't really disposed of at all. In Pennsylvania, oil and gas waste can be "dewasted" under "beneficial use" policies that studies show are risky and harmful.

## Oil & Gas Waste Life Cycle



### HEALTH ALERT

At all stages of the oil and gas waste management process, toxins can enter the environment accidentally (spills, leaks, waste truck rollovers, and illegal dumping) or legally under current state and federal law (road spreading, discharge to rivers, landfill leaching). Oil and gas waste contains varying amounts of heavy metals, radioactive materials, salts, hydrocarbons, and other pollutants, some of which are carcinogenic and threaten human and environmental health. A list of oil and gas waste contamination cases can be found in our full report *Still Wasting Away* at Earthworks.org.





Photo: David Walczak

## Solid Waste

Pennsylvania allows for some solid oil and natural gas waste to be “beneficially used” through land application.<sup>34</sup> Earthworks and partner organizations have raised concerns that runoff is inevitable from the burying and spreading of solid oil and gas waste, such as drill cuttings, in a state with frequent rain and a hilly landscape.

In 1986, the Pennsylvania legislature amended the state’s Solid Waste Management Act to specifically exclude drill cuttings from the definition of “solid waste.”<sup>35</sup> Drill cuttings and most other solid oil and gas wastes go to municipal and industrial landfills. These landfills produce leachate, a liquid waste created from rainfall that leaches through debris. Leachate is taken to municipal sewage treatment facilities, where it is passed through systems that cannot remove radioactive elements and other pollutants. This is how rivers in Pennsylvania have become radioactive and created carcinogenic byproducts in drinking water systems downstream (see Waste Pollution Violations, page 11, and State Supported Contamination, page 19).

### Case Study: Belle Vernon (Fayette County, PA) From solid waste to toxic liquid leachate

Until May 2019, there were 15 municipal sewage facilities discharging leachate from landfills accepting oil and gas waste. Today, there are 14. That’s because one facility, in Belle Vernon, Fayette County, finally had the flow of leachate to their facility from Westmoreland Sanitary Landfill stopped after independent testing revealed elevated contaminant levels – including cancer-causing radium-226 and radium-228 – in the wastewater being discharged from their facility to the Monongahela River.<sup>36</sup>

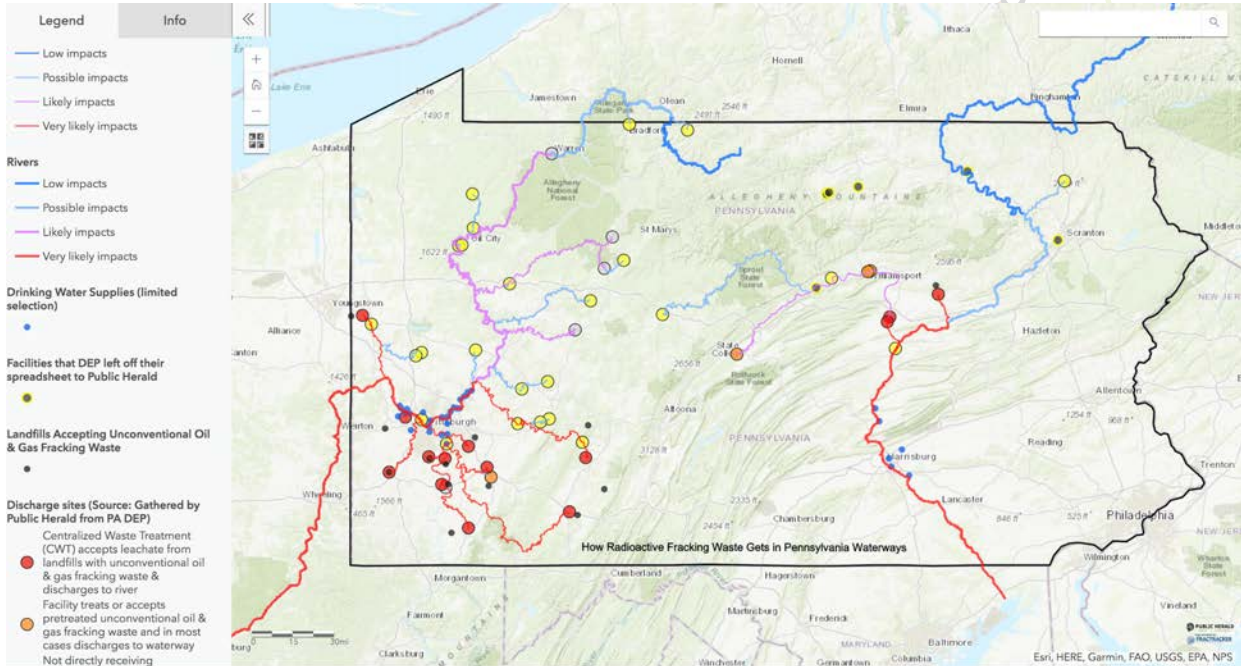
It wasn’t DEP who got the pollution stopped, in fact DEP had instructed Belle Vernon facility supervisor, Guy Krupa, to keep taking the leachate, even after Krupa shared his test results with DEP. Krupa had to involve attorneys and go around DEP to get a court-ordered injunction and “force the landfill to stop and shut off the pipe” that carried an average 100,000 gallons of leachate three miles from the landfill to the Belle Vernon facility every day.<sup>37</sup> Instead of stopping the contamination itself, the DEP instead urged Krupa to keep putting it in the river and let the landfill pay Belle Vernon’s fines for polluting.

Why would the agency do such a thing? Well, when you think about it, DEP is in the business of issuing permits to pollute. That’s what oil and gas, as well as other types of permits, allow companies to do. And then there are “tipping fees” – the revenue DEP earns for every ton of waste dumped into landfills, up to \$6.25/ton in some cases.<sup>38</sup> The oil and gas industry alone send over 1,442,465 tons of solid waste to landfills in 2018. If DEP earned tipping fees on every ton, that equals over \$9 million in fees collected by DEP that year.

*“The DEP has known that fracking waste contains highly radioactive elements like radium at concentrations **more than 1000 times the drinking water standard**. Yet, they have failed to properly safeguard the public against the impacts of this toxic wastewater.”*  
— Youghiogheny Riverkeeper Eric Harder.<sup>39</sup>



## FACILITIES ACCEPTING OIL AND GAS LEACHATE



LEACHATE MAP: An August 2019 Public Herald investigation, mapped by FracTracker Alliance, revealed the location of facilities currently and previously discharging fracking waste leachate, a selection of drinking water supplies located downstream of discharge facilities, and the likelihood of impact to waterways from these discharges. To use the interactive map, visit <https://publicherald.org/pennsylvania-is-discharging-radioactive-fracking-waste-into-rivers-as-landfill-leachate-impacting-the-chesapeake-bay-ohio-river-watersheds/>.



A truck carrying over 4,000 gallons of wastewater rolled over in Elizabeth Township, Pennsylvania in August 2019, spilling near the Youghiogheny River.

The fracking boom put almost 15,000 of these tanker trucks on our roads in 2018 alone.

Photo: Sutersville Volunteer Fire Department

Liquid waste is not tested for all toxins that could be present before being discharged into rivers where we recreate and source our drinking water.

Photo: Erik McGregor/Pacific Press/Alamy.com

## Liquid Waste

Oil and gas wastewater generated in Pennsylvania ends up in several places: on roads, in rivers, and down injection disposal wells. Like its solid counterpart, liquid waste is not tested for everything that's actually in it.

### Discharging Into Waters of the Commonwealth

DEP permits the discharge, or release, of liquid oil and gas waste into rivers, creeks and streams. This happens a couple of ways:

- **Centralized Wastewater Treatment Facilities (CWTs)**—Operators truck or pipe liquid waste to these facilities, which specialize in processing wastewater from drilling and fracking operations for reuse by the industry or discharge into waterways.

One CWT facility, operated by Eureka Resources in Standing Stone Township, Bradford County, creates two leftover products from the treatment process — 1) processed wastewater that it pipes to the Susquehanna River, and 2) sodium chloride that it packages on site in Clorox Pool Salt bags and sends to market.<sup>40</sup>

- **Publicly-owned Wastewater Treatment Facilities (POTWs)** —Conventional oil and gas operators are permitted to take their liquid waste to municipal sewage treatment facilities, also known as POTWs, for discharge to rivers. At POTWs, the industry's liquid waste is mixed with other types of wastewater, such as domestic sewage, and then passes through the facility's treatment system before being dumped into waterways. (See Leachate Map, page 15.)



There is no label on the Clorox Pool Salt indicating it is fracking waste (frack salt), leaving the unsuspecting consumer none-the-wiser.

Photo: www.cloroxpool.com

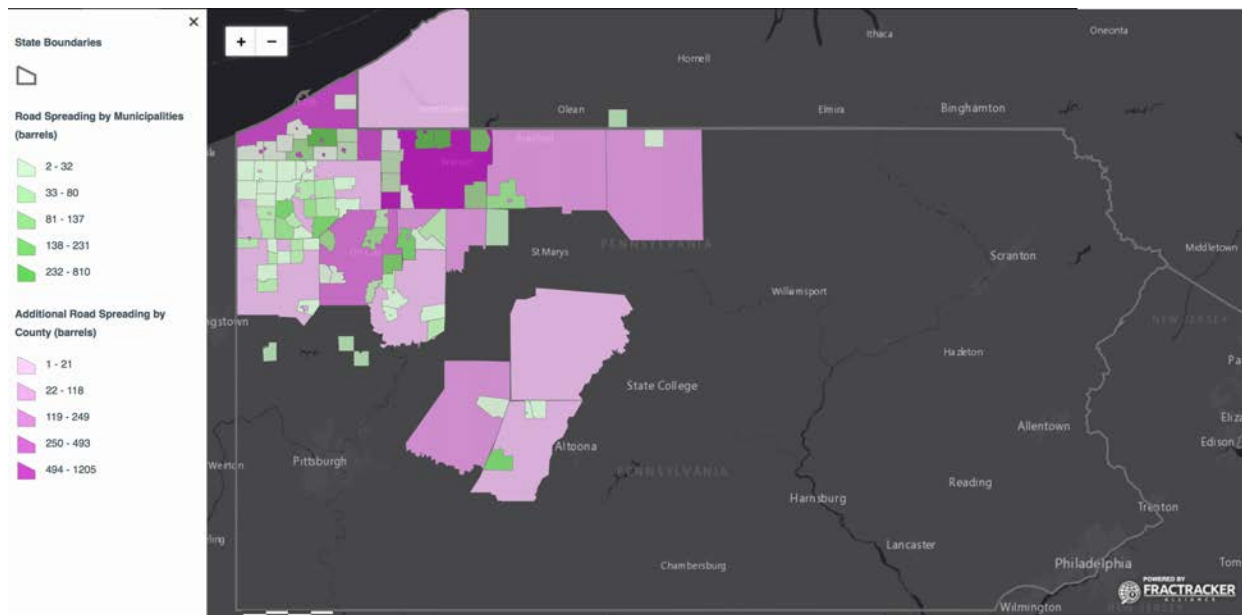
In 2016, U.S. EPA put a stop to wastewater discharges by unconventional oil and gas operators to municipal treatment plants nationwide after drinking water contamination occurred in Pennsylvania. DEP had allowed the practice to continue even after contamination was discovered. But even EPA's "zero-discharge rule" did not stop some operators from continuing the harmful waste discharges, and due to industry pressure, EPA extended the deadline to comply until August 29, 2019. As of that date, operators will (hopefully) have to stop what DEP continued to allow for years after drinking water in Pittsburgh was tainted by carcinogenic trihalomethanes, which EPA internal memos called "one of the largest failures in U.S. history to supply clean drinking water to the public."<sup>41</sup>

The majority of oil and gas operations that kept sending unconventional waste to municipal facilities, despite the federal zero-discharge rule, are located in the district of state senator Joe Scarnati, who has accepted more campaign donations from the oil and gas industry during the fracking boom than any other senator in the Commonwealth.<sup>42</sup>





# Spreading Waste on Roads



WASTEWATER SPREADING ON ROADS: Map of wastewater spreading in Pennsylvania counties and municipalities by FracTracker. To see the interactive map, visit <https://www.fractracker.org/2017/08/roadspreading-og-waste-dumping/>.

Like some other states, Pennsylvania also allows wastewater (known as brine) from conventional (non-shale) oil and gas wells to be spread on roads as a dust suppressant under the state's "beneficial use" regulations.<sup>43</sup> Some studies have documented contamination and other risks of spreading oil and gas wastewater on roads:

- In 2015, a DEP study concluded that the potential exists for recreationists using roads treated with brine to be exposed to radiation, and recommended that the radiological environmental impacts of using oil and gas field brine for dust suppression and de-icing be studied further.<sup>44</sup>
- In 2018, Dr. William Burgos and his team at Penn State University found elevated levels of cancer-causing radium in samples from wastewater that was spread on roads. Some samples tested as high as 2,270 picocuries per liter. The average sample result was 1,230 pCi/L. The standard for drinking water is 5 pCi/L, and the industrial wastewater standard is 60 pCi/L.

Radium has a half-life of more than 1,600 years and can accumulate in the environment where oil and gas wastewater is repeatedly sprayed. Radium is also a known carcinogen that increases the risk of bone cancer, lymphoma, leukemia and other illnesses.<sup>45</sup>



Truck spreading brine in New York. Photo courtesy of No Fracking Way.



Photo: Courtesy of No Fracking Way

## Case Study: Farmington Township (Warren County, PA)

After watching her family and neighbors' health diminish every time oil and gas wastewater was spread on their dirt road, Siri Lawson filed a lawsuit<sup>46</sup> against the DEP to get the practice stopped. During the case, DEP admitted that the agency had violated state law, the Solid Waste Management Act, by allowing the spreading of oil and gas "brine" waste on roads over the last 30 years. DEP stopped issuing waste spreading approvals in May 2018 and has not yet resumed; however pro-oil and -gas legislators in the PA General Assembly have introduced a slew of bills to roll back regulations for the industry so that road spreading of waste can resume.<sup>47</sup>

In the past, in order to spread brine, companies have been required to submit a "certificate of analysis" that shows the waste has been tested for toxins. However, the testing is very minimal and does not include dangerous oil and gas pollutants such as radium – a known carcinogen.

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A recent study found that spreading conventional oil and gas wastewater "brine" on roads in Pennsylvania has released 200 times more of the carcinogen radium into the environment than all oil and gas industry spills combined.<sup>48</sup> But radium is not the only pollutant of concern – a 1990 study of the road spreading of conventional oil field brine in Ohio found that the practice caused chloride concentrations in nearby groundwater to exceed EPA drinking water standards two-fold in the winter and five-fold in the summer.<sup>49</sup>

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In spite of growing scientific evidence of public and environmental health risks from road spreading, legislation by pro-oil and gas politicians in Pennsylvania has come dangerously close to passing the General Assembly.

Senator Joe Scarnati has accepted more oil and gas money than any other senator in Pennsylvania.

In 2019, he introduced Senate Bill 790, which would have exempted wastewater (brine) from the Solid Waste Management Act under which it is regulated. With such an exemption, road spreading of wastewater could resume.

Source: MarcellusMoney.org.<sup>50</sup>





Photo: Frank Finan

## State-Supported Contamination

Over the years, several lawsuits and investigations have revealed cases where the Pennsylvania Department of Environmental Protection has documented pollution from oil and gas waste operations, yet continued to allow that pollution to contaminate drinking water, rivers, soil, and air, and put public health at risk:

- 2013:** DEP found pollutants, including carcinogens, downriver from a wastewater treatment facility in Warren, Pennsylvania that at levels that were more than 100 times higher than those found upriver. The plant had been discharging waste from oil and gas operations and amassed over 400 violations since 2010 for exceeding pollution limits. Despite knowing this for years, DEP allowed discharges to continue. It took an environmental nonprofit, Clean Water Action, filing a lawsuit to get it stopped.<sup>51</sup> According to local residents, the radioactive sediment discovered by state agencies was never removed from the Allegheny River, which is a source of drinking water for several towns and cities, including Pittsburgh.<sup>52</sup>
- 2014:** Court depositions revealed that Pennsylvania regulators had omitted from a report measurements of harmful contaminants near a waste impoundment.<sup>53</sup>
- 2016:** After DEP continued to allow oil and gas operators to discharge unconventional liquid waste to rivers via municipal treatment plants, which contaminated drinking water downstream, U.S. EPA stepped in and passed a “zero discharge rule” that prohibited the practice nationwide.<sup>54</sup>
- 2017:** An investigation by a team of journalists and scientists revealed DEP letting polluters off the hook for drinking water contamination and leaving families without clean water.<sup>55</sup>
- 2019:** DEP told Belle Vernon Municipal water treatment plant to continue accepting leachate from landfill taking fracking waste despite spikes in radioactivity and other contaminants.<sup>56</sup>

DEP has significant discretion to create and enact its own policies, but the agency must also answer to the law as set by Pennsylvania legislators. There is an opportunity, despite the lack of political will, to create a robust regulatory scheme that can protect public health and the environment. However the leadership in Pennsylvania over the past few decades has missed the chance to manage oil and gas operations, particularly waste and pollution issues, based on sound science. Instead, the rush to frack came first, and the rules to govern the industrial boom came later, as an afterthought.



# How Oil & Gas Waste Became “Non-hazardous”

As this report outlines, oil and gas waste contains many toxins – carcinogens, heavy metals, radioactive materials, and other, undisclosed “hazardous constituents.”<sup>57</sup> Despite this fact, hazardous waste laws do not apply to the oil and gas industry. Why? It’s actually a long story, but the short story is – the industry lobbied for an exemption from hazardous waste laws, and politicians gave it to them.

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In 1976, an industry trade group, the Interstate Oil & Gas Commission, committed itself to influencing federal regulators in order to exempt the industry from the hazardous waste sections of the Resource Conservation and Recovery Act (RCRA). In 1988, that’s precisely what the U.S. Environmental Protection Agency (EPA) did, and the industry has enjoyed this special exemption ever since. Earthworks and allies sued the EPA in 2016, forcing the agency to look again at the rules governing oil and gas waste under RCRA. In April 2019, EPA decided not to revise how oil and gas waste is regulated, and this dangerous loophole remains. For more, see our RCRA Timeline online at [earthworks.org](http://earthworks.org).

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Despite the risks posed by Pennsylvania’s shale gas waste, the state has given oil and gas companies the same ‘free pass’ as the federal government by exempting the industry’s waste from state hazardous waste policies. This means that, even though the wastes could physically be characterized as “hazardous,” the industry doesn’t always have to treat it that way. These exemptions mean less testing, less tracking, and weaker management of these wastes.

## Oil & Gas Law In Pennsylvania

Pennsylvania defines oil and gas field waste as “residual” waste, which includes “any garbage, refuse, other discarded material or other waste including solid, liquid, semisolid, or contained gaseous materials resulting from industrial, mining, or agricultural operations. . . provided that it is not hazardous.”<sup>58</sup> (Remember: oil and gas is exempt from hazardous waste rules, so that last bit doesn’t apply, anyway.)

### Several laws do, however, apply to oil and gas waste in Pennsylvania:

- **Act 13 (the Oil and Gas Act)** – Passed in 2012 more than six years after the first Marcellus well was drilled in Pennsylvania. Most of the state’s previous oil and gas law dated back to 1984. Act 13 contained requirements for waste containment at well sites and reporting by waste haulers.
- **Solid Waste Management Act** – Pennsylvania legislature amended in 1986 to specifically exclude drill cuttings from the definition of “solid waste.”
- **Title 25, Chapter 78 of the Pennsylvania Code** – In 2011, DEP began updating Chapter 78. In 2012, the legislature passed Act 13, requiring DEP to redo the Chapter 78 rules again. In 2014, legislators added language to a budget bill that split Chapter 78 into two, adding Chapter 78a for the unconventional industry and leaving Chapter 78 for the conventional industry. In 2015, DEP issued draft rules that included better waste policies, such as banning temporary waste pits and requiring upgrades or closures of large waste ponds, called impoundments. In 2016, the Chapter 78 and 78a rules were passed, but Governor Wolf gave in to industry and political pressure and scrapped the new Chapter 78 rules for the conventional industry. The unconventional industry regulations, Chapter 78a, went into effect October 2016, but DEP has been prohibited from enforcing some of those rules due to legal challenges from the Marcellus Shale Coalition, an industry trade group.<sup>59</sup>






Centralized impoundment in Pennsylvania. Photo by Robert Donnan.

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Prior to the state's Chapter 78 & 78a regulatory update in 2016, waste impoundments were permitted with certain conditions, such as the use of leak detection and groundwater monitoring systems.<sup>60</sup> However, leaks and pollution still led to drinking water and soil contamination incidents.

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We must close the hazardous waste loophole for the oil and gas industry in Pennsylvania and stop sending waste into rivers.

Photo: Pennsylvania State University

## Recommendations: No More Policies That Pollute

Despite some updates to oil and gas law in Pennsylvania, major policy gaps still remain that place harmful toxins into the environment and put public health at risk. Earthworks continues to push for the following protections from the harms created by oil and gas waste. Without these policy changes, unnecessary risk and unavoidable contamination will continue to plague Pennsylvania and communities downstream:

- **Remove exemptions and apply hazardous waste policies to oil and gas wastes** — The hazardous waste loophole for the industry in PA must be closed. Oil and gas operators must follow the same rules as other similar industries; if the wastes they create meet the definition of hazardous, they should be managed as such.
- **Require disclosure** — The oil and gas industry should never be allowed to discharge any waste material into rivers or release any waste byproduct on the commercial market without full public disclosure of all chemicals used in specific operations. No more “trade secrets.”
- **Require “zero discharge” of oil and gas wastewater from all treatment facilities** — As research included in this report clearly shows, both unconventional and conventional oil and gas wastewater, as well as the leachate from landfills that accept solid oil and gas waste, can cause contamination of rivers and drinking water downstream when it is passed through facilities that discharge to waterways. This practice must stop.
- **Require treatment and disposal of wastes at specialized industrial and hazardous waste landfills** — Municipal landfills should be prohibited from accepting all oil and gas field wastes, conventional and unconventional, until full disclosure and testing is required, as standard practice.
- **Prohibit the spreading of wastewater on roads and use of solid waste in construction or pavement projects** — As demonstrated by studies outlined in this report, dispersing oil and gas waste into the environment elevates risks and increases exposure to toxins. Therefore, the industry’s waste should always remain “waste” and never be used for other so-called “beneficial” purposes.
- **Verify waste tracking and reporting data** — Although operators, transporters, and waste facilities provide waste tracking information to DEP, the agency should adopt mechanisms to verify its accuracy and compare records to ensure accurate reporting by all parties.
- **Test and handle radioactive oil and gas wastes according to more stringent guidelines** — All waste should be subjected to the most stringent radiological testing possible on a consistent basis. Because the content of waste varies from well to well, the waste from every well site should be tested before that waste leaves the well site.



# Endnotes

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